NOTES ON SOIL ALGAE IN DIFFERENT REGIONS IN EGYPT

BY

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Abstract:

A study on the algal flora in eight soil samples from Maadi, Barrage, Fayum and Heliopolis revealed the presence of 49 taxa belonging to Bacillariophyceae, Cyanophyceae, Chlorophyceae and Xanthophyceae. Botrydium granulatum, Vaucheria sessilis and Spirogyra sp. were the dominants in the field soil. Microcoleus chthonoplastes, Osillatoria tenuis, Mougeotia sp., and Vaucheria sessilis were the dominants in the plant nursery soils. Oscillatoria brevis was a common species in the four localities of collection. Although the diatoms had the largest number of taxa, yet not a single taxon was found to be common.

INTRODUCTION

Soil algae occupy a position far more important than some other groups of microorganisms. This fact appears clearly from the extensive studies of algae in various types of soil in different regions in the world. An important role in the maintenance of soil fertility is played by algae, especially blue-green algae, since many of them are capable of fixing atmospheric nitrogen.

The majority of algal studies in Egypt were done on the algal flora inhabiting water sources. Whereas little work was done concerning soil algae in the country. The following is a brief reference to the results given in earlier publications, that we are aware of, concerning Egyptian soil algae. El-Nayal (1935) stated that terrestrial algae are common on wet soil especially on the banks of the Nile and its tributaries after the flood water recedes, and in desert they are common in wadies under stones after a shower of rain. He mentioned that they include Protosiphon, Vaucheria, Oliveria, Botrydium and some Myxophyceae. He found that Hydrodictyon reticulatum and Protosiphon botryoides were common in a few samples collected from a rice field at Giza. El-Ayouty and Ayyad (1972) described common blue-green algae (22 species) in soil of a field in the Nile Delta and provided an account of their distribution in relation to variation in soil characteristics. In 1974 El-Ayouty and Ibrahim gave further notes on Egyptian soil blue-green algae. As far as we are aware, the work of Kobbia and El-Batanouny (1975) is the first recorded quantitative survey of algal flora of different soil types in Egypt. They studied soil algal flora in the region of Wadi El-Natrun. They recorded 28 species of Cyanophyceae, 3 of Chlorophyceae and 2 of Bacillariophyceae. They noticed that the population decreases with the increase in the salinity and the number of species increases with the increase in organic matter content. They found also that the most dominant species were Nostoc muscorum and Fischerella musicola.

The aim of the present study is to make some contribution to the, so far, little work already done on soil algae in Egypt.

MATERIAL AND METHODS

The samples of study were collected from four localities: Maadi, Barrage, Fayum and Heliopolis. The samples were taken from the surface of different types of soil as tabulated below:

Regions	Date of collection	Source of soil	No. of samples taken
Maadi	17/12/79	Soil surface of a trifolium field	1
Barrage	2/7/80	Soil surface in a garden	1
Fayum	5/7/80	Soil surface under a water basin	2
Heliopolis	12/7/80	Soil surface from pots in a plant nursery	4

pH of soil samples (except for Heliopolis) was measured and various nutrients were estimated (see table 1). Names of algal taxa existing in the samples are given in table 2.

Table 1: Values of pH and nutrients in the four localities of collection. Values are given in p.p.m. R = Region, M = Maadi, B = Barrage, F = Fayum and H = Heliopolis.

R	pH	No_3	PO_4	Cl	Na	Ca	M	K	Co_3	Hco_3
M	6.7	0.6	2.5	26	63	0.4	0.4	7.8	-	213
B	6	0.3	0.05	24	64	0.2	0.1	15.6	-	101
F	6	2.2	1.3	31	109	0.1	0.03	23.4	7.5	259
	6.7	0.6	3.1	60	241	0.5	0.6	62.4	22.5	289
H		1.3	0.3	219	46	4.2	0.7	15.6	-	50
		28	0.4	109	97	4.6	0.2	7.8	-	61
		7	1.9	17	419	0.4	0.1	62.4	-	101
		28	0.7	92	103	0.3	0.1	23.4	45	594

RESULTS AND CONCLUSIONS

Talbe 2 shows that Bacillariophyceae is represented by 34 taxa, Cyanophyceae by 8, Chlorophyceae by 5 and Xanthophyceae by 2; making a total of 49 taxa in the localities under investigation. From the same table it is clear that species belonging to the four groups of algae show different distribution in the various localities. Thus at Maddi Botrydium granulatum is predominant while Vaucheria sessilis and Spirogyra sp. are dominant. At Heliopolis Vaucheria sessilis and Mougeotia sp. are predominant while Microcoleus chthonoplastes and Oscillatoria tenuis are dominant. At Fayum Elliopsoidiom stichococcoides is predominant.

Oscillatoria brevis is the only alga met with in the four localities, however, in different states of occurence: predominant at Heliopolis, dominant at Maadi and Fayum, and just-present at Barrage.

It is interesting to note here that Pennales are the group to which belong most of the recorded diatoms since it is represented by 31 taxa, whereas the Centrales are represented by only 3 taxa namely: Cyclotella ocellata at Barrage and Melosira granulata and Stephanodiscus apinuligeres

at Fayum. Althoug the diatoms had the largest number of taxa over the other groups of algae present in the samples yet not a single taxon was found common.

Chemical analysis showed that the highest value of nitrates was recorded in Heliopolis (Table 1: samples no. 6 & 8).

El-Nayal (1935) mentioned that the genus Botrydium granulatum (Xanthophyceae) is a terrestrial alga common on wet cultivated soil. The present find of Botrydium granulatum in a trifolium field at Maadi confirms El-Nayal's observation.

Species of the genus Vaucheria (Xanthophyceae) are known to flourish at different times of the year and to dominate other forms of soil algae (see for example: Ralph, 1977, Isrealson, 1949). As also observed in the present study Vaucheria flourished in July at Heliopolis and in December at Maadi.

Oscillatoria spp. (Cyabnophyceae) are usually recorded among dominant forms of soil algae in different parts of the world (e.g. in Saudi Arabia: Abu-Zinada and El-Huseiny, 1975; Abou El-Kheir, 1976). Three species of this genus are recorded, mainly dominant, in the four regions of the present study (see table 2).

Microcoleus chthonoplastes and Nostoc muscorum (Cyanophyceae) are recorded as dominant forms of soil algae in a rice field from Iraqi marshes by Al-Mousawi and Whitton (1983).

The former alga is recorded dominant in the present study and the latter by Kobbia and El-Batanouny (1975) from Wadi El-Natrun.

Navicula sp., Pinnularia sp. (diatoms), Chlorococcum humicola (green) and Phormidium sp. (blue-green) are recorded among the most common Egyptian soil algae from Wadi El-Natrun by Kobbia and El-Batanouny (1975). These four algae are among those recorded in the present study, however, they were met with less frequently.

Table (2): The recorded algal taxa in the 8 collected samples. M = Maadi, B = Barrage, F = Fayum, H = Heliopolis, d = dominant, P = Predominant and T = present.

Algal taxa	Sample No.							
	M.	B.	F.		H.			
	1	2	3	4	5	6	7	8
Bacillariophyceae:								
1. Achananthes Bergiani							+	
2. A. brevipes angustat (Grev.) Cl.						+		
3. A. brevipes intermedia Kz.						+		
4. Amphora coffaeiformis borealis (Kz.) Cl.					+			
5. A. coffaeiformis salina (W. sm.) A.Cl.	+							
6. A. pediculus vetteri				+				
7. Cocconeis placentula intermedia (Her. & Per.) Hust.	+							
8. Diploneis elliptica genuina f. minor	+				+			
9. Fragilaria virescens exigua Grun.							+	
10. Gomphonema parvulum exilissimum Grun.						+		
11. G. parvulum genuina May			+					
12. Navicula antiqua A.Cl.							+	
13. N. bicapitellate Hust.				+				

Table (2): (Cont.)

Algal taxa	Sample No.							
	M.	B.	F.		H.			
	1	2	3	4	5	6	7	8
14. N. cryptocephala subsalina Hust.			+	+				
15. N. verecunda Hust.			+					
16. Nitzschia amphibia acutiuscular Grun.				+			+	+
17. N. apiculata (Greg.) Grun	+							
18. N. fonticola romana (Grun.) A.Cl.					+			
19. N. gotlandiea						+		
20. N. obtusa scalpelliformis Grun.	+							
21. N. sigma clausii (Hant.) Grun.	+				+	+	+	+
22. N. thermalis intermedia Grun.	+			+				
23. N. thermalis minor Hilse					+			+
24. Pinnularia globiceps genuina A.Cl.				+				
25. P. inconspicua Oster.			+					
26. Rhicosphenia curvata marina (W.Sm.) Grun.			+	+				
27. Rhopalodia gibba ventricosa (Kz.) Grun.	+							
28. R. gibberula constricta (W.Sm.) A.Cl.				+				
29. Surirella abies major				+				
30. S. abies minor		+		+				
31. Synedra ulna biceps Long.		+						
32. Cyclotella ocellata Pant		+						
33. Melosira granulata (E.) Ralf.			+					
34. Stephanodiscus apinuligeres Grun.				+				
Chlorophyceae:								
35. Chlamydomonas sp.	T							
36. Chlorococcum humicola				T				
37. Oocystis naegelii		T						
38. Mougeotia sp.					P	P		P
39. Spirogyra sp.	d							
Cyanophyceae:								
40. Chroococcus turgidus		T						
41. Ellipsoidiom stichococcoides			P	P				
42. Microcoleus chthonoplastes							d	
43. Osciliatoria brevis	d	T	d	d		P	P	P
44. O. lutea contorta				T				
45. O. tenuis	T				d		T	
46. Phormidium ambiguum								T
47. P. inundaturm								T
Xanthophyceae:								
48. Botrydium granulatum	P							
49. Vaucheria sessilis	d				P		P	
Number of taxa in each sample	14	5	8	15	8	7	9	7
Number of taxa in each region	14	5	19		20			

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